The DOMINION EXPERIMENTAL FARMS

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A system of agricultural experimental stations operated by the Dominion Department of Agriculture which investigates agricultural problems for the benefit of the Canadian farmer

Market lambs on alfalfa pasture at the Central Experimental Farm, Ottawa

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DOMINION
EXPERIMENTAL FARMS
● EXPERIMENTAL FARMS
▲ EXPERIMENTAL STATIONS
△ EXPERIMENTAL SUB-STATIONS
□ FOREST NURSERY STATION
YUKON
WHITEHORSE
NORTH WEST TERRITORIES
FORT SIMPSON
BRITISH COLUMBIA
SMITHERS
PRINCE GEORGE
KELOWNA
SUMMERLAND
AGASSIZ
SAANICHTON
ALBERTA
FORT VERMILION
BEAVER LODGE
LACOMBE
LETHBRIDGE
MANYBERRIES
SASKATCHEWAN
SCOTT
MELFORT
SUTHERLAND
REGINA
INDIAN HEAD
SWIFT CURRENT
MANITOBA
BRANDON
MORDEN
MELITA
ONTARIO
KAPUSKASING
QUEBEC
NORMANDIN
STE ANNE DE LA POCATIERE
L'ASSOMPTION
OTTAWA
STE CLOTHILDE
SMITHFIELD
HARROW
WINDSOR
N.B.
FREDERICTON
NAPPAN
KENTVILLE
LENNOXVILLE
P.E.I.
SUMMERSIDE
CHARLOTTETOWN

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The Dominion Experimental Farms

THE Dominion Experimental Farms Service has branch experimental stations in all the provinces of Canada, as well as in the Yukon and the Northwest Territories. The purpose of this little booklet is to give a brief outline of the nature and scope of the work undertaken by this organization. Reliable information and advice, based on experience and experiments, are available without charge to farmers and others interested in agriculture.

History and Development

The Dominion Experimental Farms were established in 1886. The Dominion Parliament at that time, realizing the need for some action on behalf of agriculture, appointed a select committee to inquire into the best means of encouraging and developing agriculture throughout Canada. This committee recommended among other things the establishment of a system of Experimental Farms. In 1885, the Minister of Agriculture, Sir John Carling, instructed Dr. William Saunders to visit the Experimental Farms in the United States and to make recommendations. Based on Dr. Saunders' report, a bill bearing the title "An Act Respecting Experimental Farm Stations" was introduced in Parliament and received the assent of the Governor General on June 2, 1886. Under this Act five Experimental Farms were established: one at Ottawa, known as the Central Experimental Farm, to serve as headquarters; one at Nappan, Nova Scotia, to serve the Maritime Provinces; one at Brandon, Manitoba, for the province of Manitoba; one at Indian Head, Saskatchewan, for the then Northwest Territories; and one at Agassiz, British Columbia, for the province of British Columbia.

The main lines of investigation to be undertaken by the Experimental Farms were outlined in the Act. These included livestock breeding and nutrition; dairying; the development of cereals and other field crops, grasses and forage plants, fruits, vegetables and trees; the study of seeds, fertilizers, plant diseases and insect pests; the investigation of diseases of domestic animals; and "any other experiments and researches bearing upon the agricultural industry of Canada, which are approved by the Minister." In later years some of these activities have been transferred to other branches of the Department.

Dr. William Saunders was appointed the first Director of the Dominion Experimental Farms, a position he filled until March 31, 1911, when he retired on account of old age and ill health. He was succeeded by Dr. J. H. Grisdale who had been

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Agriculturist for some years at the Central Farm. Dr. Grisdale left the position in March, 1920, to take the post of Deputy Minister of the Department of Agriculture. He was succeeded by the present Director, Dr. E. S. Archibald who had served for several years as the Dominion Animal Husbandman.

When the Dominion Experimental Farms were established, agriculture in Canada was relatively small and primitive as compared with its present position. As it expanded into new regions and as it became more developed and complicated, many new and difficult problems arose. At the present time over one thousand five hundred experimental projects are being investigated on the various Dominion Experimental Stations throughout Canada.

Organization of the Dominion Experimental Farms

The Dominion Experimental Farms Service comprises the Central Experimental Farm, Ottawa, twenty-four Branch Farms or Stations, two Forest Nursery Stations, thirteen Substations and eight Branch Laboratories. Many of the Branch Stations are engaged in some specialized fields of agriculture such as horticulture, grain production, livestock, fox farming, range improvement, forestry, irrigation and agricultural engineering.

A total of 23,957 acres of land is owned by the Dominion Experimental Farms. In addition, 26,245 acres are leased and operated by the Experimental Farms, but the major portion of this leased property is range land.

As a connecting link between the Dominion Experimental Farms and the farmers of Canada, there has been established a system of Illustration Stations and District Experiment Substations. There are 219 of these stations located in various agricultural regions throughout Canada. They consist of land, rented for a number of years from private farmers, on which experiments are conducted to determine the best agricultural methods for these regions. Under this arrangement there are 36,012 acres rented, together with an additional area on these private farms which is supervised but not rented.

Central Experimental Farm, Ottawa

At the Central Experimental Farm, Ottawa, the headquarters of the system, are located the Director, who is the general administrator, and ten Divisions, each under the control of a divisional chief with a staff specialized in each field of work. Agricultural problems originating either at the Central Experimental Farm or on the Branch Stations are reviewed by these specialists and projects are prepared to be undertaken wherever the problems are most serious. The Divisions include: Animal Husbandry, Bees, Cereals, Economic Fibre Production, Field Husbandry, Forage Plants, Horticulture, Illustration Sta-

tions, Poultry and Tobacco. The following statements will give some idea of the lines of research and experiment being conducted by these Divisions.

ANIMAL HUSBANDRY DIVISION

To the farmer and prospective settler, the Animal Husbandry Division offers the results of experience acquired through practice and experiment, accruing from the maintenance of approximately 8,000 head of livestock on the Dominion Experimental Farms and Stations in different parts of every province of Canada.

In the studs, herds and flocks of the Dominion Experimental Farms there is represented practically every breed suited to general and special conditions of soil and climate. This selection of breeds has been arrived at only after years of trial. Unsuitable breeds have been eliminated. Desirable breeds have survived and have been subject to improvement through the best methods of breeding and management.

The Place of Live-Stock in the Varying Types of Canadian Agriculture

The next logical step has been to secure the best possible co-ordination of livestock with the various methods of farming in Canada; in the older, central parts; in the great Prairie Provinces; the specialized conditions of British Columbia; and lastly, the newly settled frontiers, ever pushing into great areas still to be brought under cultivation.

Group of Clydesdale stallions, imported from Scotland in 1934 by the Dominion Department of Agriculture and distributed to various Experimental Farms as an aid to horse breeding.

Aside from advice concerning such matters there is available an even more direct service to settlers and farmers, in the pioneer districts, in the distribution of high class purebred sires, the progeny of specially selected foundation studs, herds, and flocks. No effort is spared in maintaining the excellence of these breeding centres. Only sires backed by highly qualified ancestry in breeding and production, and preferably only those that have been proved good breeders are used and the stock that is offered to the farmers is, in turn, subject to rigid selection.

In the older areas of the country the breeding work is of a more advanced nature, involving experimentation with systems of breeding, including in-breeding and line-breeding, for the purification of strains for desired economic characters, or, as in the case of sheep, cross-breeding to take advantage of a combination of two or more types with resultant hybrid vigour in the production of top grade market lambs.

Experimental work is the main function of the division. Every animal, every building, every device, serves two distinct purposes. It is maintained first for the experimental data which may be collected through it and second for its utilitarian value.

Of the many types of animal husbandry problems being dealt with, the following will indicate the type of work and a few of the results achieved:

Breeding Breed comparisons of cattle are made from the standpoint of suitability and economy of production. In these comparisons the feed requirements and cost of production are being secured and compiled. Feed cost of milk production data are available under a variety of climatic and management conditions.

Comparisons of breeds of sheep are made to determine their suitability for wool and lamb production under both Western range and Eastern farm conditions. In addition, new breeds are being developed in an attempt to produce animals that will meet range conditions and yet give better wool and lamb returns than the average range ewe. The "Romnelet", a product of crossing Romney Marsh rams on Rambouillet ewes, gives promise of fulfilling the purpose in mind.

Breeds of swine were evaluated for bacon production and the outstanding breed was proved to be the Yorkshire. Later studies, involving progeny testing and in-breeding and line-breeding, have been made on this breed with the object of perfecting and purifying the same for the production of high quality bacon carcasses.

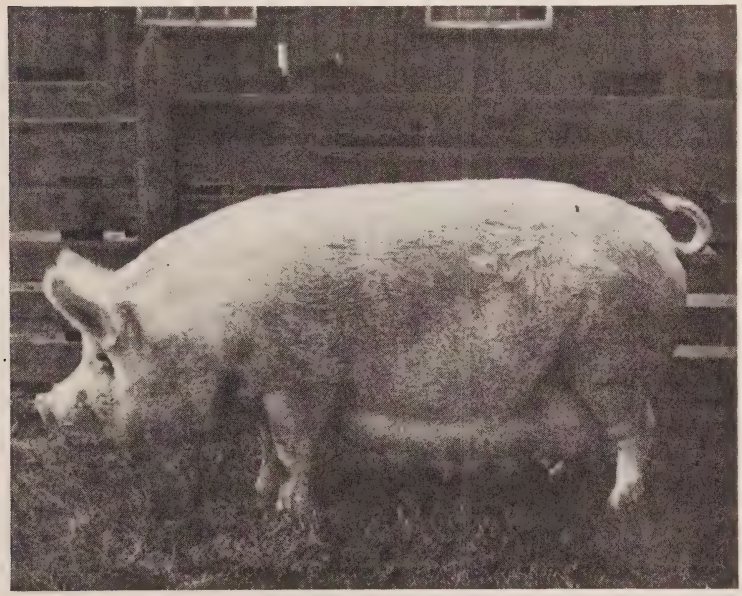
Studs of breeding horses are maintained, each headed by an outstanding stallion which latter also stands for service of mares of the district at a nominal fee. These studs demonstrate the improvement possible in horse breeding through the use of superior animals, and supply the material for a study of horse

breeders' problems. Latterly, in view of the falling off in horse breeding, attention is being given to experiments in artificial insemination of mares with the object of making more economical use of outstanding sires recently imported from Great Britain.

At the Buffalo Park, Wainwright, Alta., animal hybridizing work with domestic cattle and bison is in progress, its object being to evolve a cross combining the hardiness of the buffalo with the meat qualities of domestic cattle.

Feeding and Nutritional Studies

This work includes experiments with the feeding of livestock, tests of farm-grown feeds—hay crops, ensiled crops, succulent roughages; tests of grain, mill feeds and mill by-products from the standpoint of economy of purchase and production; experiments with variously compounded rations to learn their effect on milk production, in the production of power, of beef and lamb production and in studies of the effect of feeds and feeding on type, quality and carcass formation of market hogs. As a result of such tests, recommendations and advice on the practical feeding of livestock are given



Yorkshire sow of good bacon type, one of those being used in the prepotency and in-breeding project at the Central Experimental Farm, Ottawa.

through correspondence, personal contact, bulletins, reports and exhibits. Fundamental research studies in animal nutrition are also being conducted. This work is being done in co-operation with the Division of Chemistry, Science Service, and includes

the determination of digestibility of Canadian feed stuffs and the factors which affect the same, with a view to properly evaluating Canadian feeds. Work is now being carried on in various lines with beef cattle, sheep and hogs.

Housing, Equipment and Disease Control Studies are made of the housing of livestock under the varying climatic conditions of Canada, working always toward the type of building of maximum utility and minimum cost, and including tests of livestock building equipment and accessories. The information thus gained has been incorporated through an architectural service into suitable plans of farm buildings which are distributed free of charge. Livestock hygiene; the effect of cheap housing, exercise, feeds, methods of feeding and management on animal welfare; the practical effect of common-sense methods of management as applied to disease prevention; co-operative experiments and trials on different methods of disease control, are all given careful study by the division.

Farm Manufacture and Dairying Experiments are conducted with the handling, preparation for market, and manufacture on the farm of farm dairy products—milk, butter, cheese; trial and introduction of new varieties of cheese and the origination of new varieties. Co-operative studies along with the Bacteriological Division are made of certain bacteriological problems such as clean milk production and the comparative effect on quality as shown by the elimination of sources of contamination. Milking machines and other apparatus entering into the production of milk are studied from the bacteriological as well as from the standpoint of mechanical efficiency.

Reliable Information A vast store of practical and scientific information as well as that gained from experience and experiments is available to the farmer, the settler or the student. To this is being added year by year, further facts and figures, the result of experiment as applied to newer fields; suitable breeding methods with the various classes of livestock; feeds and feed mixtures for beef cattle, dairy cattle, horses, sheep and swine; economical practices for the production of livestock and livestock products, suitable housing and equipment; management practices and practical hygiene. Such information is available through publications and through the Superintendent of every Experimental Farm or Station devoted to livestock work.

BEE DIVISION

Although the first apiary of the Experimental Farms Service was established at Brandon, Manitoba, in 1891 and the apiary at Ottawa in 1893, it was not until 1915 that a separate division was created to take care of this particular phase of agricultural endeavour.

Shortly after the division was formed, other apiaries were started at Branch Farms in all of the provinces. There are now 11 branch apiaries, varying in size from five to over one hundred colonies. Not all of these apiaries are used for experimental purposes, the smaller ones, consisting of only a few colonies, are for the purpose of demonstrating modern equipment and modern methods of keeping bees based on the results obtained in the larger experimental apiaries.

The division through this chain of apiaries conducts experimental and research work in swarm control, wintering, disease control, colony manipulation and many other phases of practical beekeeping. It has also carried out extensive projects related to the fermentation, granulation and storage of honey. In addition, certain studies are being made of nectar and pollen secreting plants, and also of the pollens found in honey. It also examines samples of dead brood and bees for disease, makes analyses of samples of honey, and in many other ways endeavours to assist both established and prospective beekeepers and to improve the beekeeping industry of Canada as a whole.

Races of Bees

At least four different races of bees are kept in Canada, the Italian race, however, being predominant. Tests of these races are being made at some of the Branch Farm apiaries in order to determine the race most suitable for each producing area of Canada. Italian, Caucasian and Carniolan bees have been well tried at Ottawa over a period of 14 years and here the Italians proved themselves superior to the other two races. The same results have so far been obtained at Charlottetown, P.E.I. The Caucasian bees, however, are excellent honey gatherers, as also are the Carniolans. The latter race has too great a tendency for swarming. A more extensive test is being conducted in the apiary at Brandon, Manitoba. Here it has been shown that not only can the swarming impulse of the Carniolans be controlled but the crop produced by them greatly increased.

Swarm Control

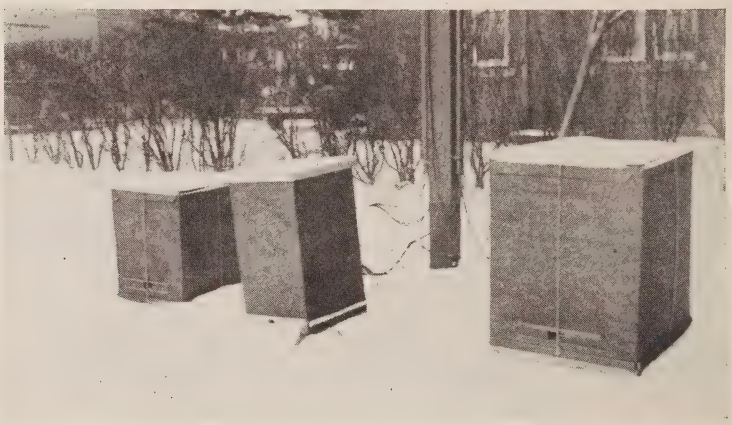
Swarming and honey production are not compatible, therefore, studies are being made of the factors that appear to influence this habit of bees. In spite of preventive measures, however, certain strains of bees are determined to satisfy the swarming instinct in the natural way. To meet such cases, three satisfactory methods of swarm control have been developed and tested. Two of these methods are now used extensively by commercial beekeepers. A newer method combining; swarm control, greater production of honey and artificial increase of colonies has recently been developed.

The first definite sign of swarming is the presence of eggs or larvae in queen cells. To find them it was necessary to examine every comb in the colony, considerable time and labour being required. This division, however, has experimented with

several methods for detecting swarming preparations without the necessity of examining each comb. One of these methods, the divisible brood chamber, has proved highly efficient and enables the beekeeper to examine at least ten colonies with the same amount of time and labour as required for one colony by the previous method.

Wintering

This is one of the greatest problems of Canadian beekeeping. The season during which bees are able to gather supplies is comparatively short, while the winters are long and severe. The average life of the bee during the summer months is approximately six weeks, but in winter their life must be prolonged to at least eight months. To do this requires a careful study of colony strength, food supply and protection in



Wintering Bees. Testing hive temperature with resistance thermometers. Six thermometers in each hive connected with recording instrument in office building, Ottawa.

relation to wintering. At one time it was thought that bees could not survive the winter in many parts of Canada unless housed in specially constructed cellars, but the Experimental Farm apiaries have shown that bees can be safely wintered outside anywhere in Canada if given the proper care before the onslaught of real cold weather.

Colony Management

Several experiments are included under this heading. In a country so large as Canada one expects to find a great variation in climatic conditions and flora, so that a system of management suited to one region may be entirely unsuitable for another. These variations are being studied and the Branch Farm apiaries are engaged in developing systems of management best suited for the regions they serve.

In this connection the honey producing possibilities of the different regions are being studied and new areas are being

opened up. It is only a few years ago that beekeeping was thought to be wasted effort in the Prairie Provinces of Canada, but the total honey crop of these provinces now exceeds 16 million pounds.

Bee Diseases

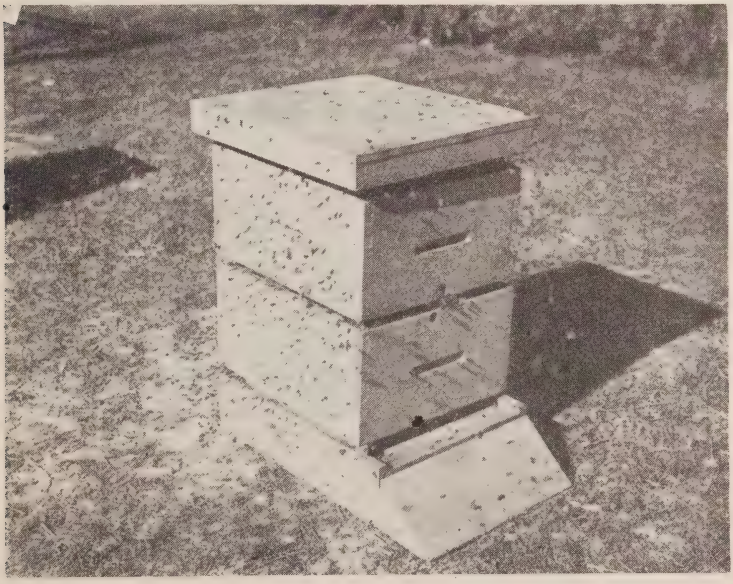
The loss of bees and equipment through American foulbrood has been enormous and a heavy annual toll is still extracted. Recent research work indicates that certain sulpha drugs are effective against this disease. Extensive tests with this method of treatment are being carried out at Ottawa. The results of the first year's work are highly promising.

Bee diseases are diagnosed free of charge. Samples of infected brood sent to the division at Ottawa are microscopically examined, the nature of the infection determined and the beekeeper is then advised as to the best means of eradicating the infection.

Other Work

Projects dealing with the pollenization of clovers, the training of bees to visit certain types of crops, the feeding of pollen substitutes, the sterilization of combs etc. are also under way.

Apiary instruction sheets are sent to beekeepers on request. Their value lies in giving briefly direction for the carrying out of certain manipulations.



Feeding Pollen Substitutes. Shows dummy hive which encloses rack of five trays. These trays are filled with a dry mixture of 8 parts of soybean flour and 1 part of dried brewers yeast (medicinal). Bees have access to this mixture.

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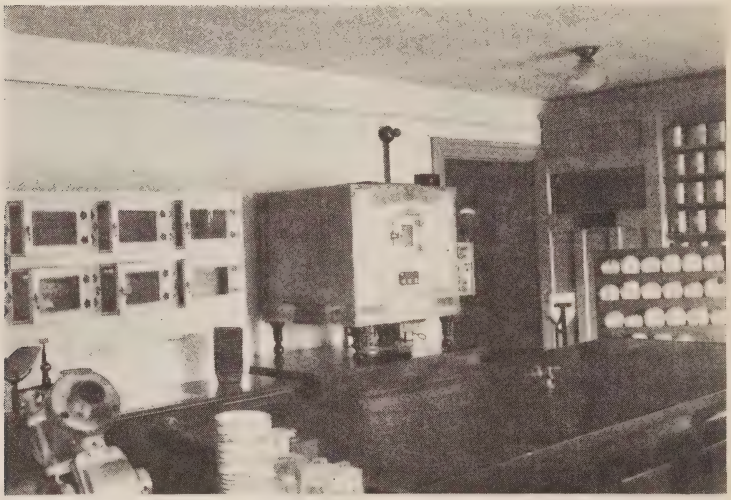
Beekeepers in difficulties are invited to submit their problems to the Bee Division at Ottawa or to their nearest Experimental Farm Apiary where they will be aided by personal advice.

CEREAL DIVISION

The chief function of the Cereal Division is to make available for use on farms in all parts of Canada, the most profitable varieties of cereal grains, peas, field beans, flax and buckwheat. The program of work involved in seeking to attain this objective requires the prosecution of an intensive system of breeding designed to create better and still better types. It also calls for the importation of new promising varieties from other sources.

All promising varieties are subjected to an intensive system of comparative testing at widely scattered points. In this work Dominion Experimental Farms and Stations, Illustration Stations and individual farmers participate. Lists of the varieties found most suitable for different zones within each province are published annually in most provinces by a special committee or board composed of both Dominion and Provincial officials.



Baking Laboratory, Central Farm, Ottawa, where quality of all new wheat is appraised.

A second major function of the division is to ensure a continuous supply of Foundation Seed and Registered Seed of approved varieties for propagation primarily by members of the Canadian Seed Growers' Association.

While breeding work with all cereals is conducted intensively by the Cereal Division at Ottawa, certain phases of this work

are stressed at a number of selected stations as well. Thus there is concentrated at the Dominion Laboratory of Cereal Breeding, Winnipeg, work in the development of rust-resistant varieties of spring wheat and oats. The Experimental Station at Swift Current concentrates on the development of sawfly-resistant varieties of wheat and on the creation of dry land barley. The Indian Head Farm specializes on the selection of better varieties of seed types of flax from populations supplied chiefly from Ottawa. Brandon specializes in the production of better barleys for Manitoba and Eastern Saskatchewan. Other stations also have their specialties, all carrying on a certain amount of selection work from populations either created by themselves or supplied them by another station for the purpose.

In the appraisal of all wheat varieties produced by the Dominion Experimental Farm System exacting quality tests are made. These are conducted at divisional headquarters, Ottawa, where a well-equipped milling and baking laboratory is maintained.

Incidental to the main projects of the division there are a number of research and other problems which come in for consideration. Among these might be mentioned the classification and description of varieties; problems connected with quality in wheat and wheat products; inheritance studies in connection with certain characters or qualities in various cereals; the boiling quality in peas and the determining of the varietal composition of wheat samples obtained from overseas cargoes in order, among other things, to ascertain the varieties which are being the most widely grown and exported. Finally, considerable time is devoted to the development and improvement of machines and apparatus used in connection with the work.

Accomplishments

Since the inception of the Dominion Experimental Farms System over 60 years ago, many hundreds of different varieties both of Canadian and foreign origin have been carefully appraised. Those found worthy have been indicated and their use encouraged. Many new varieties have been brought into existence. Of these, the most widely known variety undoubtedly is Marquis wheat. The introduction of this variety was a truly epoch-making event since it transformed wheat growing over large areas in the West from a relatively hazardous undertaking to a reasonably safe enterprise. In more recent years, however, the creation and introduction of the rust-resistant varieties Renown and Regent, produced by the Cereal Division; Apex developed by the University of Saskatchewan, and Thatcher created by the University of Minnesota have met with even greater acclaim. Indeed, the almost universal use in Manitoba and Saskatchewan of these four varieties, during the six years of war, increased the total output tremendously. In this connection, a calculation based

on data obtained from tests comparing the yielding ability of these newer varieties with Marquis has shown that Canada actually produced from two hundred and fifty to three hundred million bushels more wheat during this six-year period than she would have produced had these disease-resistant varieties not been grown.

In the drier areas of the Prairie Provinces lying to the west of those subject to rust, wheat stem sawfly has been one of the great inhibitors of successful wheat growing. The situation here, however, promises to be alleviated if not entirely relieved by the introduction of varieties capable of resisting the attacks of the insect. The variety known as Rescue, developed by the division at the Swift Current Station, with the co-operation of entomologists, is being introduced in 1947. Other still more desirable types are in the offing.

In eastern Ontario, a new cash crop has emerged through the introduction of a winter-hardy variety of winter wheat called Rideau. Developed at the Central Farm, Ottawa, from a Kharkov—Dawson's Golden Chaff cross, this variety is gaining rapidly in popularity and now occupies a considerable area in the eastern sections of the province.

The oat crop which has an important farm value in Canada has gained a decided impetus through the introduction of the rust-resistant and otherwise highly meritorious varieties Van-

Interior of one of the Cereal greenhouses at Central Farm.

guard, Ajax and Beaver. These varieties, all products of the division, are being widely grown and are proving a distinct boon especially in districts subject to rust.

In central Alberta, where the need for an early ripening, strong strawed variety of oats has long been recognized, the recent introduction of the variety Larain, developed at the Lacombe Station, promises to mean much to the oat growers within this area.

One of the latest varieties of oats to be licensed for sale in Canada has been named "Beacon". This was derived from a multiple cross made at the Central Farm, Ottawa. Beacon is much more resistant to crown rust than are the other varieties mentioned and for this reason is expected to prove particularly valuable in areas especially subject to this disease. In 1947 this variety showed considerable susceptibility to a new form of root-rot known as the *Helminthosporium victoriae*.

Another recently licensed variety of oats called "Garry" will be introduced in Western Canada in 1947. This variety was developed at the Dominion Laboratory of Cereal Breeding, Winnipeg. It is credited with being able to resist all of the different races of stem rust and crown rust of oats thus far found in this country. Garry has given an excellent account of itself in many field tests conducted and is likely to become a standard variety in some areas at least.

In Manitoba and over large areas of Saskatchewan the introduction of the variety of barley called Plush, developed at the Experimental Farm at Brandon, has added substantially to the barley output of these areas. A more recent Brandon-bred variety called "Vantage" promises, however, to supersede Plush fairly quickly throughout this territory. Vantage has not only given higher yields than Plush in comparative tests during the past three years but it has the added advantage of being stronger in the straw and consistently heavier in the kernel as well as being resistant to rust.

The early ripening barley variety Prospect developed at the Swift Current Station for the drier areas of the southwest has proved of distinct value throughout this area.

The substantial expansion which has taken place in certain parts of Canada in recent years in the growing of field peas has been aided greatly by the use of two excellent varieties Arthur and Chancellor, both developed at Ottawa. These are the varieties chiefly grown in most of the larger pea growing districts throughout Canada at the present time.

A variety of white field bean selected at the Central Farm was licensed in 1943 under the name of Corvette. This yielded well in western Ontario, particularly in the counties of Middlesex and Huron.

FIBRE DIVISION

The Division of Economic Fibre Production was organized in 1915, in order to promote the growing of fibre plants in Canada. While the work thus far has been confined largely to investigations in connection with the growing of flax and prepar-

Modern Flax Pulling Machine Manufactured in Canada.

ing the fibre and seed for market, nevertheless experiments have been conducted with many types of fibre plants in order to determine their suitability for Canadian conditions.

In a country so large as Canada, with its great range of climatic and soil conditions, it is natural to suppose that there are localities particularly suited for the growing of fibre crops. In order to determine where the best flax will grow in the Dominion, the division sows a small acreage of flax at the Branch Farms located in the various provinces. The straw from these small plots is either shipped to the flax mill at the Central Experimental Farm where it is deseeded, retted and scutched, or as in the case of a few Branch Stations, the flax is processed at flax mills in the district. This adaptation test proved to be of great value in locating areas well adapted to the growing of flax during the period 1939 to 1943 when the Canadian fibre industry expanded enormously.

Demonstration Mills Having located the district where the development of the industry appears most suitable, the next step is to demonstrate to the farmers in those localities the best methods of growing, harvesting, retting and scutching the crop. For the purpose of demonstrating the growing, cultivating and harvesting of flax, experimental plots are located on Branch Farms and in commercial districts where the farmers may see

for themselves the actual operations in progress. In order to find out the best methods of retting and processing, experimental flax mills are located at the Central Experimental Farm and at Portage la Prairie, Man.

Marketing the Fibre and Seed At the present time there are two linen weaving plants in Canada, but the yarn used in these plants is imported from Ireland because there was no spinning mill for flax fibre operating in Canada from which yarn might be supplied. However, just recently one spinning mill for line fibre has been established at Drummondville, Quebec, and two spinning mills for tow fibre are being organized. The division has continued to lend valuable assistance to Canadian flax growers in the marketing of both fibre and pedigree seed. The surplus fibre, over domestic requirements, is sold either in Europe or in the United States. There is prospect for export of Canadian pedigree fibre flax seed to Northern Ireland, France, United States and South America and this division is doing everything in its power to encourage producers to grow pure seed of the most popular improved varieties.

Other Investigations In addition to the activities above outlined, the division is carrying on work at Ottawa in testing different varieties of home grown and imported fibre seed with a view to securing varieties that will produce high yields of good quality and of high spinning value. Flax is being sown on different types of soil in order to determine which type will

The Pilot Flax Mill, Portage la Prairie, Manitoba.

produce the highest yield and the greatest length, strength and quality of fibre. Experiments are being conducted in order to determine the best stage for harvesting flax under Canadian conditions where both seed and fibre are saved. Various tests with artificial fertilizers are in progress for the purpose of ascertaining their influence on yield and quality of fibre and seed. Cost of production studies are made in order to find out whether or not the various methods of procedure are economically sound before definite recommendations are made to growers.

The division is equipped with a modern laboratory in which the latest and most scientific methods of plant breeding and plant selection work may be studied. Also, considerable experimental work is being done with respect to the spinning, weaving and dyeing of domestic linens produced in Canada.

In 1944 this division established a pilot flax mill at Portage la Prairie, Manitoba, for the purpose of studying the possibilties of producing and retting fibre flax in the Prairie Provinces, the production of pedigree fibre flax seed, the utilization of fibre from linseed flax straw in the production of upholstering tow and in the manufacture of cigarette, bank note and linen bond papers.

FIELD HUSBANDRY DIVISION

The Field Husbandry Division is responsible for investigations to secure information on the most efficient methods of field crop production under various soil and climatic conditions. Such investigations include specific research and experiments in connection with cropping methods, soil tillage, fertility tests, soil erosion control, soil survey which is the basis of most of the other soil studies, crop rotations, weed eradication, pasture improvement, farm machinery investigations, meteorological studies, soil laboratory research, and farm management practices.

Soil Surveys

Soil surveys are conducted in all provinces as co-operative projects with the Agricultural Colleges and Provincial Departments of Agriculture and in the Yukon and Northwest Territories. The object of these surveys is to determine the nature, extent and location of the various types of soil in Canada and to classify them on a systematic basis. This information is used for many different purposes, particularly where problems of land use are concerned, such as cultural cropping and fertilizer practices, land settlement and land appraisal. It also provides an inventory of the soil resources of the country.

Rotations

Rotation and crop sequence experiments have been conducted over a long period of years in both Eastern and Western Canada. In Eastern Canada and the more humid parts of Western Canada rotations should be planned to provide for crops best adapted to the type of soil upon which they are

grown and in keeping with the kind of farming followed whether it be livestock farming, the production of cash crops or a combination or mixed farming. In the Prairie Provinces summer-fallowing to conserve moisture has been an important consideration in planning grain rotations. Attention must also be given to cropping for the control of wind erosion and weed eradication.

Soil Cultivation

Perhaps one of the earliest steps in agriculture advancement was tilling or cultivating the soil to promote greater crop production. It remains an important operation in the farm enterprise. Soil cultivation requires a tremendous amount of power and experiments which show that shallow ploughing is followed in most cases by as high yields as deep ploughing provide useful leads in reducing power consumption and improving the farm economy. In the Prairie Provinces it has been found that the ploughless fallow and the use of one-way disks, blade and rod weeders to retain a trash cover on the surface of the soil prevents soil drifting and thus increases crop yields.

Experimental area for soil erosion studies, Central Experimental Farm, Ottawa.

Soil Fertility

One of the most important problems in agriculture is the maintenance of soil fertility. Farmyard manure, commercial fertilizer and proper cropping practices are used in various ways to maintain the organic-matter content and fertility of the soil. At the Central Experimental Farm, Ottawa,

it has been shown that where manure is plentiful, supplementing with superphosphate provides a well balanced source of fertility when applied to the soil. Where manure is scarce it should be supplemented with complete fertilizers and where no manure is available yields may be maintained by the use of commercial fertilizers alone in conjunction with suitable cropping methods. The application of small amounts of concentrated fertilizer has given economical increases in yield in the sub-humid sections of the Prairie Provinces. In the drier areas, however, the use of commercial fertilizers generally has not proved beneficial. Extensive experiments are at present under way to study the fertility needs on various soil types and widely differing climatic conditions.

Drought and Soil Drifting in the Prairie Provinces

In connection with the important problems of drought and soil drifting in the Prairie Provinces, a considerable amount of experimental work is in progress on Dominion Experimental Farms, District Experiment Substations and Reclamation Projects. The adverse effects of drought are offset to some extent by suitable rotations and by summerfallow practices which result in the maximum conservation of soil moisture. Soil drifting has been successfully controlled by the practice of strip farming and the adoption of improved methods of surface cultivation. In extreme cases it may be necessary to seed down to grass.

Soil Erosion by Water

One of the most insidious soil losses which occurs in Canada is that resulting from sheet erosion by water. It takes place almost unnoticed. Experiments conducted by the Field Husbandry Division have shown that this loss can be very extensive. In four months in 1945, with 15 inches of rainfall, 31 tons of soil per acre were washed off a corn plot with rows running up and down a 10 per cent slope. In one rain of 2·99 inches on June 21, 1946, 75 tons of soil per acre were washed off a summerfallowed plot on a 10 per cent slope in one hour. Plots planted to grass or legumes or with other crops cultivated on the contour lost little or no soil thus indicating methods of controlling soil erosion. This problem is being carefully studied at a number of Stations throughout Canada.

Soil Moisture Investigations

Profitable crop production on the Canadian Prairies depends to a very considerable extent on the economical utilization of the limited supply of moisture. The Field Husbandry Division has conducted for many years a series of experiments on the Dominion Experimental Station, Swift Current, Saskatchewan, to determine the fundamental relationship between soil moisture and crop growth. These experiments have definitely shown that the essential feature of summerfallowing is the destruction of moisture-consuming weeds, and that the cultivated soil mulch is of little value in conserving soil moisture. Many experiments are being conducted throughout the Prairie

Provinces in order to learn the best methods of conserving moisture including different summerfallowing methods, basin listing, contour furrowing, and terracing.

Weed Eradication The loss to Canadian Farmers caused by weeds is impossible to determine, but estimates suggest that it amounts to approximately 70 millions of dollars annually. To learn the most effective and least expensive methods of weed eradication, a large number of experiments have been instituted.

Of outstanding interest in recent years are the results which have been obtained by chemical sprays and dusts in the control of weeds. Many chemicals have been developed which act selectively, killing the weeds growing in crops without seriously injuring the crops. In fact in most cases the crop yields are increased by the treatment. Copper sulphate has successfully controlled mustard in grain crops. Sinox has been very satisfactory in killing mustard, lambs quarters, pig weed and other annual weeds growing in grain crops and in lawns. The newer 2,4-D spray has also given excellent results in killing many annual as well as perennial weeds in grain and grass crops with little or no injury to grain and grass. Sodium chlorate has been found very useful in killing perennial weeds and woody plants in fence rows, roadways, and other such uncropped areas.

An important source of weed infestation is manure containing weed seeds. Experiments have shown that piling manure in a compact pile from one to three months will destroy most of the weed seeds.

Experiments are conducted on Stations throughout Canada with reference to tillage and cropping methods for eradicating weeds. Shallow cultivation has been effective in controlling certain weeds. Summer ploughing and after harvest cultivation has been beneficial. Cropping with alfalfa for several years has controlled Canada thistle and certain other perennial weeds.

Agricultural Engineering On farms in Canada there is an investment of 600 million dollars in farm implements and the purchases of new equipment amounted to approximately 100 million dollars in 1946. In view of the relative importance of farm machinery not only as an investment but also in relation to farm practices, experiments are being conducted on the utilization of various types of equipment in tillage, seeding, spraying, fertilizing, harvesting and processing equipment to learn their relative efficiency, costs of operations and essential requirements in all types of farm operation.

Investigations are also conducted on land clearing methods and equipment, structures and equipment for applying irrigation water, drainage, livestock equipment, building plans and ventilation of buildings, application of electric power to farm operations, and on machinery for the control of weeds. Special atten-

tion has been given to improvement of implements for soil drifting control, application of tractor power to farm work, and the utility of equipment on various types and sizes of farms.

Forage crop harvester under trial by the Field Husbandry Division

Harvesting Experiments Proper harvesting methods are essential in ensuring good quality farm crops. Extensive experiments have been conducted to determine the best methods of harvesting and storing hay crops. Handling hay with a minimum of labour has been possible by using sweep rakes, forage crop harvesters, hay balers, etc. Some 20 different crops have been successfully ensiled in small experimental silos. Tests have been made regarding the most satisfactory stage of maturity for ensiling, preservatives which may be used, the effect of varying the moisture content and other factors affecting the ensilage process. Grain harvesting methods have been compared using combines, power binders, stook loaders and other methods.

Pasture and Range Studies In Eastern Canada there are over 13,600,000 acres of pasture of which nearly 7,140,000 acres are in natural or uncultivated land. In Western Canada 45,000,000 acres are in range land and some 2,000,000 acres in cultivated hay and pasture. Thus almost 60,000,000 acres are used for pasture and rangeland in Canada.

The best utilization of these areas requires careful management to ensure the correct intensity of grazing and the most efficient use of the herbage. Experiments are under way at many

Stations to study these points as well as methods of seeding and fertilizing both cultivated pastures and those which are to be left down more or less permanently. Cropping methods and grazing management are also being extensively studied.

Cost of Production and Farm Management

Through data secured from field experiments conducted throughout many years, extensive information has been collected which provides data for determining the cost of producing various crops. These data also provide leads for the laying out of farm rotations to produce a proper balance of crops for livestock production or other types of farm set up.

Meteorological Records

In co-operation with the Dominion Meteorological Service of the Department of Transport careful records have been secured on all Dominion Experimental Farms and Stations of temperature, precipitation, sunshine, wind velocity and other climatological phenomena. These records along with the results from agronomic experiments supply valuable information regarding the effect of climate on crop growth.

DIVISION OF FORAGE PLANTS

The activities of the Division of Forage Plants consist of the testing of grasses, leguminous crops and hoed crops to determine their productiveness and suitability for use in Canada; the selection and breeding of grasses, legumes, corn, field roots and sunflowers; the study of hay and pasture problems; the production of seed and its distribution; special research activities such as plant introduction, plant nutrition, the experimental production of polyploids, and cytology.

Variety Tests

Extensive tests are carried on to determine the varieties of grasses, clovers, alfalfa, corn, soybeans, sunflowers, field roots and other forage plants that are best suited to the different agricultural zones of Canada. These tests include not only the old established varieties but also new varieties and selections so that information may be available at all times for the guidance of the Canadian farmer as to what types and varieties of forage plants are most suitable and productive in any particular zone. In this connection it is interesting to note the results of two projects having direct application for practical use. Variety tests of clovers and alfalfa have conclusively proved that the material from some sources was not suitable for use in Canada, owing to lack of winter hardiness. Based upon actual results of growing tests, legislation has been introduced making it possible for the Canadian farmer to readily distinguish between suitable and unsuitable clover and alfalfa seed and so reduce to a minimum the chance of loss of crop through lack of winter hardiness.

Seed increase block of Boon timothy, an improved variety resulting the breeding work carried on by the Division of Forage Plants.

Breeding and Selection

An extensive program of grass breeding has as its object the production of improved strains for hay, pasture, and turf purposes. The species with which work is carried on are timothy, orchard grass, brome grass, reed canary grass, perennial rye, meadow foxtail, blue grasses, the fescues, bent grasses, sudan grass and millets. A number of improved varieties, including Boon timothy, Parkland brome grass, Grazier western rye, Hercules orchard grass, Delta Kentucky blue grass, Chieftain Canada blue grass, Pacific perennial rye grass, Ensign meadow fescue, Duraturf creeping red fescue, and Crown and Empire millet have been developed as the result of this work and have been made available for general distribution.

Hybridization of wheat with various species of grass (Agropyron spp.) is being carried on with the object of developing large-seeded, drought-resistant, perennial grasses which would prove useful in the drier areas of the West. Some hybrid lines are now in the fifth to seventh generations and the characters perennialism, large-seededness and good fertility are becoming fairly stable.

Breeding work is also in progress with the legume crops including alfalfa, red clover, sweet clover and white clover. Improved strains of alfalfa have been developed including a new self-tripping strain for high seed production, named Canauto. A hardy, productive, early red clover variety named Ottawa has been selected and established in the Ottawa valley. A variety of wild white clover named Pathfinder has been selected from native material. Development of a superior strain of Ladino, giant white clover, is also being sought.

Early work in the breeding of soybeans resulted in the production of two new varieties, Mandarin (Ottawa), and Kabott,

while more recently two additional varieties, Pagoda and Capital, have been developed. As the varieties cover a wide range in maturity they make possible more extensive production of soybeans in Canada, by widening the area in which the crop can be grown. Seed of all four varieties has been multiplied and made available for commercial production. The breeding of field corn has resulted in the development of two highly productive, early-maturing hybrids, Canbred 150 and Canbred 250. These make possible a greatly extended area in which corn can be grown successfully for husking purposes.

Breeding work with field roots has resulted in the development of two varieties of swedes, Acadia, a bronze-top, high tonnage variety, and Wilhelmsburger, a green-top variety that has proved to be resistant to the clubroot disease. Tip-Top, a variety of yellow, intermediate mangel, is characterized by unusually high dry-matter content. Seed of all three of these varieties has been made available for distribution.

Fundamental research is being carried out leading to the creation of polyploid forms in some common forage crops. This technique involves the use of the drug colchicine, and cytological examination of progenies. This procedure has proved useful in overcoming sterility in wheat-agropyron hybrids, and polyploids have been obtained in sugar beets, mangels, swedes and red clover. The value of these in comparison with the normal derivatives is being assessed.

Hay and Pasture

Special attention is being given to hay and pasture problems. The improvement of pastures constitutes one of the major problems in Canadian agriculture. Particular attention is directed to the study of species and different mixtures of grasses and legumes, their productivity, palatability, nutritive value, aggressiveness, persistence under grazing, adaptability and reaction to fertilizer treatment.

Data collected over a period of years show that the yields of hay and pasture may be greatly increased through the use of suitable grass and legume species. The addition of alfalfa in the hay-pasture mixtures in the Ottawa areas has given a long-time average increase of 30 per cent over mixtures without this legume. Mixtures containing alfalfa and used for pastures produced 20 per cent more than similar mixtures containing alsike or red clover as the only legumes in the mixture.

Annual and supplementary hay and pastures are being compared under various conditions. New varieties of oats such as Roxton and Beacon have proved to be much more productive than the older varieties such as Banner, Victory, Erban, etc. Different varieties of fall rye for early spring pasture have also been tested. Horton and Midsummer varieties have outyielded all others.

Seed Production and Distribution

This phase of work includes the study of seed production methods, the multiplication of new varieties and strains, and the distribution of this seed to farmers through the services provided for the purpose. In recent years the following productions of this division have been accepted for registration by the Canadian Seed Growers' Association—Pagoda, Kabott, Mandarin (Ottawa), and Capital soybeans, Beacon flint corn, Canbred 150 and Canbred 250 hybrid corn, Crown and Empire millet, Sunrise and Advance sunflowers, Viking and Canauto alfalfa, Ottawa red clover, Pathfinder white clover, Delta Kentucky blue grass, Chieftain Canada blue grass, Duraturf red fescue, Ensign meadow fescue, Hercules orchard grass, Parkland brome grass, Pacific perennial rye grass, Tip-Top mangel and Acadia swede.

Multiplication block of "Ottawa" red clover, a hardy, semi-perennial strain developed by the Division of Forage Plants.

Special Research Activities

New species and varieties of forage crops are continually being introduced from all parts of the world and tested in an introduction nursery, where their promise either for direct use or for use as breeding material is ascertained. Plant nutritional studies are conducted in the greenhouse during the winter months, the plants being grown under controlled conditions, using nutrient solutions. These studies make it possible to determine suitability of certain varieties to particular types of soil, and to associate malnutrition symptoms with the special mineral deficiency under field conditions.

In addition to the work outlined, the division has perfected a cheap, quick, accurate system of dry-matter determination for the purpose of reporting forage crop yields. Experiments are conducted with turf grasses, and information is made available on the various grasses adapted to the different types of lawns. Educational exhibits are frequently prepared, and farmers are given assistance on all phases of forage plant work by means of circulars, bulletins, and private correspondence.

DIVISION OF HORTICULTURE

Horticultural work is carried on at all Branch Farms and Stations but at many it largely consists of variety testing and minor cultural experiments. The main endeavour in horticultural research and experimental work is carried on at the following Experimental Stations: Kentville, N.S., located in the heart of the Annapolis and Cornwallis valleys; Fredericton, N.B.; Central Experimental Farm, Ottawa, Ont.; Morden, Man.; Summerland, B.C., in the Okanagan valley; Saanichton, B.C., on Vancouver Island; the Substation for muck soils at Ste. Clothilde, Que.; and at the Substation for horticultural crops at Smithfield, Ont.

Fruit Breeding

Fruit breeding has constituted a major endeavour of the division since its inception. The origination of hardier varieties of apples adapted to the fruit regions of eastern Ontario and Quebec has attained practical success. Of the varieties being grown in these regions at the time this work was started only one is on the recommended list to-day, namely, McIntosh. Of the total number of six fully recommended varieties, four are originations of this division, Melba, Lobo, Atlas and Joyce. In addition, three others are being planted for extended trial, Sandow, Bancroft and Lawfam. A large number of new hybrids are also being tested, including varieties earlier than Melba and later than McIntosh. Several of the earlier sorts resulting from crosses between Melba and Crimson Beauty are already attracting attention and it is almost certain that at least one of them will be adopted for commercial planting.

In the earlier days the division had also interested itself in breeding hardier apples for the northwest of Canada. The line of attack here was hybridization between the commercial apple *Malus malus* and the Siberian Crab *Malus baccata*. The resulting crosses provided several crabs of outstanding merit to the Prairie Provinces, such as Osman, Columbia and Robin. These first crosses were again back crossed to *Malus malus* and a number of second crosses produced which, while not so hardy as the first crosses, produced two of outstanding merit, Rosilda and Trail. A second back cross series using the second crosses and *Malus malus* has been released for trial. This has resulted in full sized fruit but the final hardiness ratings are not yet available.

Plums In plum breeding attention has been paid largely to hybrids between the native plums (*Prunus nigra* and *P. besseyi*), and *P. salicina*. As a result of this work one outstanding plum, Grenville, a hybrid between *P. nigra* and *P. salicina*, has been introduced and another outstanding one resulting from a cross between *P. salicina* and *P. besseyi* has also been adopted.

Cherries Hybridization between various species of cherries has resulted in the accumulation of a lot of interesting material which is being studied and worked with from the standpoint of induced polyploidy to overcome sterility resulting from interspecific hybridization.

Small Fruits In small fruits the division has introduced several gooseberries of outstanding promise that have thornless bushes. A rust-resistant black currant has been bred and introduced, and five new raspberries of outstanding merit are being employed throughout the Dominion. They are Gatineau, Rideau, Ottawa, Madawaska and Trent. The strawberry breeding work has resulted in the introduction and use of three outstanding late varieties, Louise, Elgin and Tupper.

Left, non-resistant black currant showing defoliation in August. Right, new rust resistant black currant recently introduced by the Division of Horticulture.

Rootstocks and Tree Building One of the important problems facing the fruit industry in Eastern Canada is the heavy loss of trees from collar rot, winter injury to roots, bark splitting and crotch injury. This division is making a thorough study of the hardiness of various seedling and vegetative rootstocks and their resistance to collar rot. A comprehensive study of the value

of various hardy varieties as frameworks is also being conducted. One outstanding hardy rootstock and framework builder has been originated and released under the name Robusta No. 5. This propagates readily from stools and has been found resistant to fire blight, extremely hardy and, so far, resistant to collar rot. Other clonal or vegetative stocks have been originated and some show promise as dwarf and semi-vigorous stocks.

Plant Nutrition and Fertilizer Studies

Nutritional experiments with several horticultural crop plants have been conducted and foliage symptoms due to excesses and deficiencies have been recorded in colour. Some of these have been published and utilized in diagnosis. The effects of nutrition on certain physiological disorders of fruit and vegetables have been studied e.g., corky core in apples; brown-heart in turnips; brown curd in cauliflower; cracking of carrots and celery; crown rot of beets; all due to boron deficiency. At present comprehensive research is being conducted on the correlation of plant tissue tests and yield in an endeavour to further improve the means of diagnosing plant food requirements of horticultural crops. Fertilizer and cultural experiments in grower owned orchards are being conducted in eastern Ontario and Quebec and at Ottawa a fertilizer experiment and a study of root and scion relationships is being carried on.

Vegetable Improvement

The testing, breeding and selection of vegetable varieties to suit the various conditions in the country has been a main effort for many years. Early varieties of table corn, such as Bounty, Dorinny and Goldban, have been introduced and widely adopted over extensive areas. Earlier varieties of tomatoes, such as Abel and Bestal, have been introduced. A strain of onions known as Yellow Globe Danvers No. 11 has found wide application in short-season districts. Strains of beet, carrot and other vegetables have also been widely adopted. One important phase of this work has been the maintenance of a large number of foundation stocks of various kinds and varieties of vegetables for use by the Canadian vegetable seed industry. Breeding for disease resistance in garden peas and beans has recently been added and other crops will be dealt with from this angle as staff and time permit.

Ornamental Horticulture

Where land settlement creates new frontiers horticulture must keep pace in order to maintain attractive home surroundings under varying conditions. New plant material must be found to fit new conditions. In recent years much of the work of introducing new plant materials has been done by the western Experimental Farms where many worthwhile trees and shrubs have been tried out and distributed to farmers over a wide area. Prinsepia, cotoneasters, and hybrid lilacs are notable examples. Much of this work has been done by the Experimental Station at Morden.

At the Central Experimental Farm it has been the policy to introduce new horticultural varieties of plants not generally used by hybridists. The goal has been hardier varieties of different and improved quality. As well as the late blooming group of lilac varieties known as Syringa × Prestoniae, newer and distinct hybrids have been produced such as Romeo, Ethel M. Webster and Fountain. The series of rosybloom crabapples introduced in the early 'thirties has gained great popularity; the varieties Cowichan and Makamic being of great ornamental value. The lily varieties introduced twelve years ago have won international recognition as the "stenographer" lilies, having been named after members of the staff. The second and third generation have produced some outstanding lilies, such as Hurricane, Spitfire and Lysander. The most recent variety of merit, Sovereign, will be sent out for the first time in 1947. Many hardy bush types of roses have also been produced and distributed from Ottawa and Morden.

Horticultural Building, Central Experimental Farm, Ottawa, Ontario, with cold storage and fruit processing laboratories in the foreground.

Experimental work has been carried on to ascertain practical application of research discoveries to the florist and nursery industries as well as the amateur gardener. This includes such work as studies in plant nutrition and soiless culture, the use of growth promoting substances in plant propagation and the use of shade or artificial light to alter the blooming date of greenhouse crops.

Low Temperature Research

Low temperature laboratories are operated at Kentville, Ottawa, Summerland and Morden. At these centres research in temperature and varietal relation-

ships, humidities and nutritional effects are being studied. The utilization of controlled atmospheres in connection with the storage of apples and pears has resulted in definite recommendations for commercial application. The quality of McIntosh and Golden Russet apples has been considerably improved by the adoption of a gas mixture of 7 per cent carbon dioxide and 14 per cent oxygen, which may be maintained by a simple system of controlled ventilation. A fully equipped respiration laboratory, is operated in conjunction with this work.

Fruit and Vegetable Products

Laboratories dealing with this phase of work are operated at Kentville, N.S.; Ottawa, Ont.; Summerland, B.C. and Morden, Man. The Kentville laboratory has developed equipment and a method for the dehydration of fruits and vegetables which is now used by a number of large commercial plants in Canada, producing high quality products at reduced cost.

The Ottawa laboratory has interested itself in research work and the commercial application of freezing to the preservation of strawberries, raspberries, peas, green beans, corn on the cob, asparagus, spinach and other crops. This laboratory has also perfected a satisfactory and simple method of fruit juice preservation enabling the bottling and holding of cider and other fruit juices for prolonged periods without change.

Interior view of the test kitchen in processing laboratory of Horticultural Division, Central Experimental Farm, Ottawa, Ontario.

The Summerland laboratory has developed a method for the processing of sweet cherries as glaced stock and maraschino stock which has been given extended commercial application, in addition to a considerable effort in dehydration and fruit juice work.

Other Features

There are two Substations attached to this division, one at Ste. Clothilde, Que., which deals with muck soil investigations including: drainage, irrigation, fertilizer studies and general cultural practices and soil management largely with vegetable crops. The other Substation, located at Smithfield, Ont., is studying rotation and fertility requirements of canning crops; fertilizer studies with apples; variety testing; tree building and rootstock studies and soil erosion studies.

DIVISION OF ILLUSTRATION STATIONS

The Division of Illustration Stations was established in 1915 to provide a connecting link between the Experimental Farms Service and farmers located in outlying districts. These stations are operated on privately owned farms on the basis of a co-operative agreement entered into between the owner and the Dominion Experimental Farms Service. The original work in 1915 was undertaken at 29 points in the provinces of Alberta and Saskatchewan. By 1925 the number had increased to 223 stations located throughout the nine provinces. In 1935 there was further expansion of activities and a comprehensive farm planning and experimental program was developed which encompassed all farm operations. During that year drought and soil drifting had assumed major proportions in the Prairie Provinces and required a concerted and aggressive program of attack. As a result, the Illustration Stations in the plains area of the west were reorganized and enlarged, comprising what is now known as District Experiment Substations where work in connection with strip farming and associated cultural practices, tree planting, water impounding practices, forage crop production, and cereal production was instituted. In 1937 a new type of unit came into being, that of the District Experimental Substation with a resident supervisor in-charge, where experimental work on cereals, forage crops, fertilizers and horticultural crops is conducted on a restricted area. The present organization comprises 170 Illustration Stations, 45 District Experiment Substations in the Prairie Provinces, and 4 District Experiment Substations with resident Supervisors-in-charge giving a total area under supervision and experiment of over 60,000 acres of crop land on privately owned farms.

Since 1915 there has been a consistent broadening of the scope of divisional work, and thus it has progressed from the original purpose of disseminating information from experimental data by field and cultural demonstrations, to include crop testing and experiments of a fact-finding nature. Farm problems are studied in their local environment representing an extension of the comprehensive research work being carried on at the Experimental Farms. In this manner the results of such work are evaluated under specific conditions and are brought quickly to the communities concerned.

Plant food deficiency in grey wooded soil, Winfield, Alta.
Left: Ammonium Phosphate 16-20 + lime + sulphur.
Right: Check. No treatment.

Variability in Nature of Activities

Soil, climatic and regional market conditions necessitate considerable variation in the nature of the work on the different stations. In this connection 22 types of rotations are under study in Eastern Canada and British Columbia and 37 in the Prairie Provinces, for the purpose of determining what crops and arrangements of crops prove best adapted to particular regions from the standpoint of the control of weeds, insects, soil erosion, and maintenance of soil fertility. Studies on inherent soil productivity, the effect of chemical fertilizers on the growth of field crops, the improvement of pasture lands, the role of trace elements such as boron in controlling deficiency disorders in turnips and other crops, are integral parts of divisional activity. Specialized problems such as peat land reclamation, grey wooded soils research, and crops such as hops, cranberries, as well as those used in commercial or home canning are also under study. A total of 188 active projects are under way associated with farm problems which obtain in both old and recently developed agricultural regions.

Farm Organization and Management Studies

Farm organization and management studies are important projects and are carried on in conjunction with experimental work on station properties. Each operator maintains a weekly record of cash revenue and expenditure for all farm enterprises and a complete inventory is taken at the end of each business year. This procedure permits evaluation of farm operations from the financial as well as the experimental standpoint. Other undertakings include establishment of field divisions and farm planning as well as livestock improvement which visualizes improved breeding through high quality sires and individual milk records. The

objective on an Illustration Station is not only to develop an improved herd but eventually to become a source from which local farmers may procure breeding stock. During the year 1945, station operators disposed of 146 head of cattle, 45 sheep, 316 swine, 250 cockerels, 886 pullets, 49,240 baby chicks, and 11,059 dozens of hatching eggs.

Wheat Production

With 85 Stations located in the Prairie Provinces the growing of wheat has been a major activity since the establishment of these stations. The initial plan of cropping experiments adopted on the prarie stations was chosen with considerable foresight and two of the original crop rotations are still being followed in general practice. Thus these station units afford a continuity of records in wheat production from the standpoint of yield and cost of production under the best known and adapted systems of cropping. The all-important influence of moisture was recognized, and a rain gauge was provided as standard equipment on those stations which are situated in areas where in some years rainfall has been inadequate for normal growth and maturity of cereal crops. Precipitation and yield data through a number of years have been recorded for many localities over a wide area of the wheat growing plains.

In addition to serving as testing points for improved cereal varieties, station units also serve as centres of production and distribution for recommended varieties. In 1945 station operators disposed of 75,869 bushels of seed grain of approved varieties of which 67,675 bushels were distributed from stations in the three Prairie Provinces. Varieties such as Marquis, Reward, Garnet, Thatcher and Regent were increased on Illustration Stations and in 1946 stations in the sawfly areas of Alberta and Saskatchewan served as production and distribution points for seed of Rescue wheat while increase plots of the new variety Redman were grown on the Illustration Stations in Manitoba.

Forage Crop Seed Production

Pioneer work in the growing of legume seed such as red clover, alsike, sweet clover and alfalfa has been a feature of Illustration Station work in districts where these crops have particular adaptation. It was not until after the establishment of Illustration Station work 29 years ago that red clover seed was produced commercially in the province of Quebec. In 1917 clover was threshed for seed on the stations at Aubrey, Stanbridge East and Ste. Julie. During the intervening period studies have been made of cultural practices and fertility levels peculiar to this crop and red clover seed is now being grown on Illustration Stations and surrounding districts throughout the Eastern Provinces and British Columbia.

Coincident with the establishment of Illustration Stations in the northern areas of the Prairie Provinces, the Peace River District and British Columbia, research in the production of

seed of other legumes and grasses has progressed rapidly. Alfalfa seed production has been given considerable study in the northern prairies and Peace River and alsike seed production has become a major project on British Columbia Illustration Stations. With the advent of the war in 1939 it became apparent that there was a definite requirement for Canadian grown forage crop seeds. During the five-year period 1941-45 inclusive, operators of Illustration Stations grew and distributed by sale a total of 385,045 pounds of seed of legumes and grass plants which provided an important nucleus for the expansion of seed and forage production at a time when it was so urgently required.

Orchard Trials

The development of small home orchards is an important project on the Illustration Stations and District Experiment Substations. This work was begun in Nova Scotia in 1930 but has since become important on stations in all provinces of the Dominion. The provision of adequate protection by the use of shelterbelts has allowed for considerable expansion of this project throughout the Prairie Provinces and hardy adapted varieties of tree and bush fruits are now being grown successfully on stations in these areas. More extensive and complex experimental work is being undertaken at Fort William, Ont., and Creston, B.C. Useful information on the hardiness and adaptation of new varieties resulting from breeding work at Experimental Stations is derived from this project, particularly in the Prairie Provinces where in the early years of settlement and development fruit production was not considered as being a possibility.

Improvement of Gardens and Home Surroundings

While Illustration Station projects are primarily concerned with problems relating to crop and livestock production, the development and maintenance of attractive home surroundings is an important activity. The objective on every Station is to develop a constructive program of planting of shelterbelts, hedges, shrubbery, flower borders and the seeding of lawns to illustrate what varieties are best suited to a locality and also the most effective arrangement of varieties and species. Since 1935 a total of 38,099 evergreens and 276,500 deciduous trees have been set out on Substations in the Prairie Provinces for the purpose of demonstrating the feasibility and practicability of well planned farm shelterbelts.

Building plans for the erection of new barns and other buildings as required, improvements to existing buildings, installation of lighting and water systems and special equipment necessary to the particular type of organization are other phases of improvement projects which receive attention.

Field Days and Co-operative Efforts

Illustration Station and District Experiment Substation work is based on a policy of usefulness and service to the various communities in which they are located. It is essential that crops grown, methods

Field Day: Illustration Station, Honfleur, P.Q.

adopted and results from fact finding experiments pertaining to local problems be brought to the attention of neighbouring farmers with a minimum of delay. Field days are held on these station farms and where possible are organized in co-operation with the local agricultural society or representative. On these occasions details relative to the production of the different crops grown, selection of varieties, soil preparation, fertilizer treatment, etc. are discussed by officers of the Experimental Farms Service. An analysis of field day records shows that these events are attended annually by 20,000 to 25,000 farmers, providing an effective means of bringing the results of work done by the Experimental Farm Service to the attention of farmers in the districts served.

POULTRY DIVISION

The work of the Poultry Division both at Ottawa and upon the Branch Farms and Stations becomes increasingly more of a research nature as the industry becomes more advanced in a scientific way. Demonstration of correct practices continues to be an important phase of the work, of course, especially on Branch Farms and Substations in the newly settled agricultural areas. The finding out of facts through more fundamental types of research has become the principal effort of the Central Farm as well as that of many of the older established Branch Farms. The facts demonstrated by scientific research, tested in a more practical type of experiment and found to have practical usefulness ultimately become the material which is demonstrated throughout the Experimental Farms System to the poultry farming public.

The principal fields of poultry work may be classified as breeding, nutrition, housing and equipment, management, and disease control. These apply to chickens, turkeys, and waterfowl. Each of these fields will be dealt with briefly.

Breeding

The science of genetics has provided information which is being increasingly utilized to improve the performance of poultry. The principal effort is directed towards the improvement of egg production since this is the factor of greatest economic importance. A project to determine the best means of increasing egg production has been in operation for some years. This has embraced all the Branch Farms, which, under the direction of the officers of the Central Farm, have made a contribution annually. Many years of research have shown that the progeny test holds the greatest possibilities for advancement in egg production and this project is an attempt to determine whether production can indeed be increased by this method of breeding and if so to what extent. The large number of pedigree bred flocks on the Experimental Farms affords a unique opportunity to exploit this project in a way perhaps not possible at any other institution. Information to date indicates that even by means of a rigorous progeny test, consistent improvement in the level of egg production is extremely difficult even to the point of raising the question as to whether improvement can indeed be made by this method. Invaluable information as to the manner of inheritance of egg production is accruing from the pursuit of this project.

Developing New Breeds

Another important project deals with the establishment of new breeds. The prepotent sire project referred to above suggested that since improvement in egg production was so difficult by existing known breeding methods it might be more effective to build up new breeds of high fecundity rather than to attempt improvement in existing breeds. In addition, since all present breeds have certain characteristic defects, it should be possible to combine the best features of several breeds into one. For example white skin, white feathers, fast feathering, white eggs, non-broodiness, good market conformation, resistance to disease, economy in growth and production, and of course high egg production, some of which occur in many breeds but all of which occur in no one breed, might possibly be effectively combined by such a procedure.

As a result several new breeds are in process of synthesis, one which is to combine the above features in a large breed and another which will be similar except for much smaller size and therefore more economical for egg production. In addition a meat type breed with a particularly broad breast is also being produced. If and when these breeds are stabilized to breed uniformly true to type, they will be propagated in numbers and released to the general public.

The above are examples of the type of research being carried out. Certain of the Branch Farms are also carrying out specific breeding projects giving their whole attention to this line of work. In addition, breeding stock is being supplied to poultry men particularly in the more remote districts and the breeding work of the Farms is a continuous demonstration to all who are interested.

A range rearing experiment showing the degree to which growing pullets utilize their pasture. Those on the paddocks in the upper left which had a high protein ration utilized very little of their pasture. Other groups successfully attempted to make up for rations too low in protein by a heavy consumption of grass and alfalfa pasture, resulting in relatively bare ranges.

Nutrition

Because of the rapid advancement in the field of poultry nutrition and of the fact that in all probability greater possibilities for improvement in production exist in this field than in any other, research in nutrition has always been a major line of work in the Poultry Division. Nutrition of the chick, of the growing bird and of the laying and breeding stock are all the subject for experiment. The Division co-operates with the Science and Production Services of the Department of Agriculture in the carrying out of biological assays with chicks designed to test the vitamin potency of supplements used in poultry feeds. Such supplements are checked to see that they meet the guaranteed vitamin content shown on the manufacturers label. A study of various deficiency conditions in chicks is a part of the regular research and the best feeds for overcoming such deficiencies are tested out.

In recent years certain shortages have developed in important feed ingredients. Under these conditions it is necessary not only to find substitutes which can be utilized in place of the missing ingredients but to determine the minimum levels of the nutrients which are sufficient to maintain normal condition in the birds. For example, a very serious shortage of protein feeds, both vegetable and animal, was responsible for a program of research at the Poultry Division which demonstrated that considerably lower levels than generally recommended could be used with satisfaction and that good pasture, a relatively cheap feed source, had considerable value as a substitute for the scarce and most costly protein feeds. In fact, the utilization of home grown materials in poultry feeding has always been an important subject of research in the Poultry Division.

Feeding for egg production, for hatchability, and for fattening, are other phases of nutrition which are given attention. The period during which eggs are being saved for hatching is a most critical one nutritionally. Feeding for hatchability therefore receives much attention in a research way. Exhaustive tests over a period of years covered most phases of fattening stock for market and the most satisfactory feeds, feeding methods and general management were determined. A special bulletin was issued on the results of this research. A bulletin covering all phases of feeding of poultry was also prepared and is the most comprehensive publication of the division.

Very satisfactory range conditions. Lush growth such as the above should be cut occasionally to permit regrowth of short succulent green feed.

As in the case of breeding, certain of the Branch Farms have been chosen to carry out more fundamental research in nutrition and these, besides experimenting on subjects of particular significance to their immediate area, will have their research co-ordinated with and directed from the Central Farm at Ottawa.

Housing and Equipment Among environmental factors affecting the performance of poultry, housing is very important particularly because of the rigorous winter weather in most parts of Canada. The best types of poultry house, most efficient systems of ventilation and degree of insulation required are therefore live subjects of research throughout the Experimental Farms System. At the Central Farm some six years of research on one housing project provided information on the application of artificial heat and on the effectiveness of various degrees of insulation on which building requirements can be based for some time to come. Certain of the Branch Farms, because of more northerly exposed location which have very rigorous climates will be important units in this line of work. Management of houses and equipment is also an important phase of this work and subjects such as the best type of litter, deep litter, dropping pits and house equipment come in for their share of attention.

Disease Control At the Central Farm, Ottawa, the Division of Animal Pathology of the Department of Agriculture maintains a pathological laboratory whose officers deal entirely with poultry diseases. In co-operation with this laboratory, research into poultry diseases is carried out. Research with pollorum disease and infectious laryngotracheitis of fowl has been in operation co-operatively between these Divisions as well as certain of the Branch Farms for some time. Diagnostic and autopsy work are carried out continually and through publications and correspondence the public is advised on disease matters.

Turkeys and Waterfowl A fairly extensive program of research with turkeys is carried out at the Central Farm and is being inaugurated at one of the Prairie Stations. The growing importance of this species in the Canadian poultry economy makes it essential that this work be expanded. Comparisons of the most suitable breeds, the control of the blackhead disease and feeds and feeding methods are all under experiment.

Waterfowl (ducks and geese) are also kept and experiments in feeding and management carried out. A bird sanctuary is maintained at the Central Farm and wild ducks and geese as well as domestic breeds are kept under natural conditions. Domestication of wilds and crossing of various breeds of wild geese has been carried out.

General All of the above mentioned activities find expression in technical and practical bulletins and leaflets, through exhibits at fairs and poultry gatherings, through radio

talks, and in the large amount of correspondence with the poultry farming public. The public are invited to take advantage of these facilities.

TOBACCO DIVISION

A varied experimental program is conducted by the Tobacco Division. Special attention is given to the breeding and development of new strains, testing of imported varieties and the isolation of improved strains, and determining the chemical and physical properties of soils and the fertilizer requirements of the various types of tobacco produced in relation to the character of the soil. In addition, considerable emphasis is placed on nutrition and biochemical studies; on methods of harvesting and curing; on cultural practices; and on the control of disease and insect pests. The four Experimental Stations associated with the Tobacco Division in this program are strategically located in the principal commercial tobacco-growing areas of the Dominion; Harrow and Delhi in Ontario, L'Assomption in Quebec, and Summerland in British Columbia.

The industry has expanded and changed considerably since the Tobacco Division was formed in 1906. Some thirty-five years ago production was practically restricted to burley in Ontario, and to pipe and cigar leaf in Quebec. The greatest progressive change has occurred during the past fifteen to twenty years, with consumer taste shifting from cigar and pipe smoking to cigarettes. This has entirely transformed the requirements of production. In 1946, at least 86 per cent of the crop was of the bright flue-cured cigarette type.

A field of flue-cured tobacco with a row of kilns for curing the leaf in the background. Superior quality cured leaf is produced by regulating the curing process to give maximum conversion of starch to sugar and fixing the yellow colour when the sugar content is high.

The measure of success in improving quality by new and revised cultural technique resulting partly from planned experiments by the division over a period of years is shown by the fact that tobacco imports have been reduced from 20 million pounds in 1920 to 1½ million pounds, three-fourths of which was cigar leaf, in 1945. Furthermore, exports rose from practically nothing to about 32 million pounds in 1939. An increasing proportion of Canadian tobacco has been used in domestic manufacture. The Canadian tobacco content of cigarettes, for example, has advanced from less than 30 per cent in 1927 to 99 per cent in 1944. The quality of Canadian flue-cured leaf compares favourably with that produced in any other tobacco producing country throughout the world.

Breeding Selection and Plant Introduction

The creation of new varieties by hybridization and selection is usually a slow process. The division has recently been fortunate, however, in developing a number of improved strains. Only a few have been released for general distribution. Two new burley strains Harrow Velvet and Haronova are now grown extensively in western Ontario. In addition to producing a thin, bright leaf, Harrow Velvet is highly resistant to black root-rot. In developing better varieties for special conditions, such features as earliness of maturity, resistance to mosaic, resistance to root-rots, and improvement of aroma are of fundamental importance.

Field tests are conducted to ascertain comparative merits of varieties, and to maintain types desired and approved by the tobacco trade. Several varieties new to Canada have been introduced in the past decade. The old flue-cured varieties, Warne and Hickory Pryor, have now been entirely replaced by such varieties as White Mammoth, Yellow Mammoth, Bonanza, Duquesne, and Gold Dollar. Resistant cigar varieties of acceptable quality, such as Havana 211 and Yamaska No. 7, are grown on root-rot-infested fields in the Quebec districts. All of these varieties are thoroughly tested before they are released and recommended to the growers.

Tobacco Soils and Fertilizers

Specific soil types from the various tobacco growing districts have been analysed and classified, and on the basis of this work advice is given to prospective growers. The residual effects of fertilizers in various soils are determined. The application of rapid soil tests in the diagnosis of fertilizer requirements on individual tobacco fields is gradually becoming practicable, especially when interpreted in the light of previous crop performances. Mineral deficiencies in soil, methods of soil conservation, and the maintenance of soil organic matter by rotations and cover crops have been studied. Among the particular problems which have received attention are the potash-fixing power of various tobacco soil types, and the magnesium requirements of Ontario flue-cured soils.

Extensive experiments on tobacco fertilizers, including the balance of nutrients (nitrogen, phosphorus, and potassium) and

sources of materials for the different types of tobacco, have been conducted for the past ten or more years. As a result of these experiments, fertilizer recommendations for the various types of tobacco are drawn up annually and submitted to the fertilizer manufacturers and tobacco growers. Special tobacco fertilizers, meeting these recommendations, are now available and fertilizer practices have been reasonably well standardized for the different tobacco growing districts. In addition to investigations respecting the three principal fertilizer elements, the effect of calcium, sulphur, magnesium and chlorine, is under test.

Physiological Investigations

Physiological and chemical investigations are being conducted in an effort to clarify some of the fundamental relationships involved in the production of high quality tobacco, and include the effects of various fertilizers on the mineral composition of the leaf as well as the effect of varying weather conditions. The changes occurring in the leaf constituents as the result of various cultural practices such as seed-bed management, topping, and suckering, are included in this series of investigations. The progressive development of some of the organic leaf substances through the stages of maturity, curing and fermentation, is the object of study, and has revealed the importance of sugars in the cured leaf of flue-cured tobacco. During the flue-curing process, the transformation of starch to sugar and the fixation of colour when the sugar content is high results in high-quality leaf. The physiological aspects of nutri-

High-yielding black rootrot-resistant cigar tobacco plants being speared on laths and loaded on wagons for hauling to the curing-barn.

tion are studied in the greenhouse where the plants are supplied with nutrient solutions of pure chemicals. This method provides precise control over the nutrient supply and environmental conditions, yielding information not obtainable under field conditions. Chemical investigations are conducted on the nutrition and metabolism of the plant and on the changes accompanying fermentation of cigar leaf.

Tobacco Diseases and Insects In co-operation with the Division of Botany, Science Service, extensive research has been in progress with special consideration given to black and brown root-rots, mosaic, and leaf spots. As a result of these investigations, diseases in tobacco plant beds and greenhouses have been greatly reduced by soil sterilization and the use of fungicides. Sanitation measures around the seedlings, curing barns, fields and workers using tobacco, reduced the ravages of mosaic under field conditions in Ontario. Tobacco disease surveys and a study of rotations have revealed the importance of previous crop effects on the prevalance of brown root-rot. Tobacco insect pests are also receiving special attention through co-operation with the Division of Entomology.

Educational Work General field days are held each year at the Stations located in the chief tobacco-growing areas. These provide a channel for the dissemination of practical information resulting from experimental work, and have proved very popular with the growers. Fertilizer and variety demonstration plots located on various farms serve a similar purpose. Definite fertilizer recommendations based on experimental results are prepared at a special Fertilizer Conference, and made available to growers and fertilizer companies each year.

Contact is maintained with the growers by means of correspondence, special winter meetings, and personal interviews at the Experimental Stations and on the growers' farms. Timely circulars and press articles keep the tobacco producers informed on the most recent improved methods. Reports are published by the Tobacco Division at Ottawa, and by various Stations. Special bulletins dealing with the industry are published and revised from time to time.

The quarterly publication "The Lighter", issued by the Dominion Tobacco Service, contains information and statistics on the tobacco industry. Close co-operation is maintained with the marketing associations, the Department of Trade and Commerce and the Wartime Prices and Trade Board regarding export possibilities and the requirements of special markets. Assistance is also given in the establishment of production goals through the tobacco sub-committee of the Dominion Provincial Conference on Agriculture.

The growers are informed regarding methods of disease and insect control, and some stations render the service of cleaning tobacco seed on request. The division prepares tobacco

exhibits for display not only in Canada but for fairs and exhibitions in Great Britain and Europe. Members of the staff present adresses to farmers' organizations and to students in agricultural colleges.

An annual Dominion Tobacco Divisional Conference is held in Ottawa, at which the officials working on tobacco problems meet to discuss difficulties, review experimental results, and, in general render themselves better able to serve the tobacco growers in Canada.

BRANCH EXPERIMENTAL FARMS AND STATIONS

There are twenty-four Branch Farms and Stations, two Forest Nursery Stations and thirteen Substations throughout Canada. These Branch Stations conduct an extensive program of agricultural experimental work. Each Station has land, livestock, equipment and a trained technical staff. It works in co-operation with the specialized divisions at the Central Experimental Farm, Ottawa. In this way the experimental work throughout Canada is co-ordinated and projects are undertaken where they will be of the greatest value.

The Illustration Stations and District Experiment Substations are supervised by the Illustration Division at Ottawa through supervisors located at the Branch Experimental Farms. These Stations are located on important soil types and in regions where the climate or soil presents special problems. The staffs at the Branch Farms, through the work conducted on these Stations, become familiar with the problems and farming conditions not only on the Experimental Stations but on these outlying Stations throughout their territory. More reliable information is available, therefore, for a greater number of farmers.

During the period of severe drought and soil drifting which prevailed in the Prairie Provinces from 1931 to 1938, the Dominion Experimental Farms were in a position to give valuable assistance. When the Prairie Farm Rehabilitation Act was passed in 1935, the Dominion Experimental Farms took a prominent part, particularly with the cultural phases of the program. Experimental and demonstration work were undertaken with soil drifting control, strip farming, surface tillage, regrassing, reclamation, tree planting, farm machinery, water supply and irrigation.

On account of the wide variations in the climatic conditions throughout Canada, the following tables have been prepared showing the mean monthly and annual temperatures and precipitation on the Dominion Experimental Farms and Stations throughout Canada. As crop growth is so greatly affected by climatic conditions, it is useful to have this information covering records over such a long period of years. Soil type, as well as climatic conditions, influences the growth of various crops and these factors together with market requirements give rise to various types of agriculture in different parts of Canada.

TEMPERATURE RECORDS ON THE DOMINION EXPERIMENTAL FARMS

(Deg. F.)

Station	Station Estab.	Yrs. Ave.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Charlottetown, P.E.I.	1909	33	18·3	17·1	26·6	37·1	48·5	58·7	66·1	65·3	57·7	48·1	36·7	24·8	42·1
Kentville, N.S.	1910	31	20·5	20·1	28·9	39·3	50·4	59·5	66·3	64·9	57·7	48·1	37·3	25·3	43·2
Nappan, N.S.	1888	36	17·1	16·8	26·7	37·7	48·8	58·1	64·5	63·5	56·4	46·5	35·3	22·3	41·1
Fredericton, N.B.	1912	31	13·3	14·5	26·1	39·0	51·1	60·5	66·2	64·4	56·5	45·7	33·1	18·8	40·8
Lennoxville, P.Q.	1914	28	12·6	13·2	24·7	39·8	51·7	61·3	66·3	64·0	56·2	44·9	32·5	18·0	40·4
Ste. Anne, P.Q.	1910	30	10·9	11·9	23·4	36·4	49·3	59·1	64·9	62·5	53·9	43·7	30·5	15·9	38·5
L'Assomption, P.Q.	1928	13	11·6	11·8	23·5	40·3	54·5	63·9	68·4	66·2	57·8	45·7	32·3	15·9	41·0
Normandin, P.Q.	1935	8	−0·3	4·6	13·1	31·6	48·8	59·0	63·8	61·6	52·1	40·6	26·6	7·2	34·0
Ottawa, Ont.	1886	57	11·7	12·7	25·1	41·3	54·9	64·5	68·9	66·3	58·5	46·2	32·5	17·1	41·6
Harrow, Ont.	1909	28	24·9	27·3	35·2	45·6	57·2	67·8	72·9	70·5	64·1	52·4	39·9	28·9	49·0
Kapuskasing, Ont.	1916	27	−1·0	2·7	13·6	31·3	46·4	57·6	62·5	60·1	51·3	39·2	22·5	6·9	32·7
Delhi, Ont.	1933	10	22·3	22·9	31·2	42·7	61·9	72·7	70·5	68·5	60·5	49·2	38·1	22·7	46·9
Morden, Man.	1915	24	3·5	7·5	20·2	38·1	53·1	62·2	69·0	66·5	56·3	42·8	24·3	9·9	37·8
Brandon, Man.	1888	44	−1·5	2·3	18·3	37·8	51·1	60·1	65·5	62·7	52·7	40·3	21·5	6·6	34·8
Melita, Man.	1935	10	3·9	5·6	19·8	39·5	51·9	59·4	67·1	64·4	54·5	43·7	22·6	12·1	37·0
Indian Head, Sask.	1888	36	0·3	5·3	18·9	37·1	50·3	59·6	65·2	62·2	52·1	39·3	22·3	8·1	35·1

Swift Current, Sask.	1921	21	9·2	12·9	25·0	39·9	52·2	59·3	66·2	62·9	52·7	41·2	25·9	14·5	38·5
Scott, Sask.	1910	31	−0·3	3·7	16·5	35·8	50·1	57·5	61·1	60·9	50·4	38·3	21·5	7·1	33·5
Melfort, Sask.	1934	31	−2·7	3·0	15·9	36·1	49·7	58·1	63·1	59·6	49·6	37·3	19·5	4·7	32·8
Regina, Sask.	1931	50	−0·3	2·6	16·5	37·7	50·7	59·7	64·7	62·1	51·9	39·3	21·6	8·3	34·6
Lethbridge, Alta.	1906	41	17·3	18·5	28·9	42·1	51·0	58·6	64·5	62·3	53·3	44·5	31·5	21·9	41·2
Lacombe, Alta.	1907	35	8·5	12·3	23·3	39·1	49·3	56·1	61·1	58·5	49·7	39·9	24·7	12·9	36·3
Manyberries, Alta.	1927	14	12·7	12·8	26·9	41·7	53·3	60·4	69·0	65·9	54·9	43·1	27·3	18·1	40·5
Beaverlodge, Alta.	1915	27	8·7	13·1	22·3	37·5	49·1	55·5	60·0	57·8	49·3	39·1	23·0	11·7	35·6
Fort Vermilion, Alta.	1908	34	−11·1	−4·2	9·5	31·3	47·9	55·9	60·8	57·5	46·2	32·9	10·5	−5·5	27·6
Agassiz, B.C.	1888	48	35·1	38·2	43·8	49·9	55·7	59·9	64·4	64·1	58·2	51·1	42·4	37·7	50·0
Summerland, B.C.	1914	27	25·7	29·3	39·5	48·6	56·4	63·7	70·4	68·7	59·5	48·9	36·6	29·3	48·1
Saanichton, B.C.	1912	24	37·9	39·3	42·9	47·9	53·9	58·9	62·7	62·1	56·5	49·7	43·3	39·4	49·5
Prince George, B.C.	1939	25	12·9	18·4	29·8	40·4	49·2	56·2	59·6	58·8	50·2	41·1	29·4	16·5	38·5
Smithers, B.C.	1937	9	19·1	21·4	30·6	40·7	48·5	53·8	57·0	55·9	50·5	40·6	28·1	19·2	38·8
Whitehorse, Y.T. [1]	1945	6	8·0	13·3	21·5	33·3	45·9	54·9	55·8	54·1	46·0	35·6	13·8	6·8	32·4
Fort Simpson, N.W.T. [2]	1946	42	−18·0	−11·0	1·0	26·0	45·0	56·0	62·0	57·0	46·0	29·0	4·0	−12·0	24·0

[1] Records taken at airport; Experimental Station located 100 miles west.
[2] Records taken by Meteorological Division, Department of Transport.

PRECIPITATION RECORDS ON THE DOMINION EXPERIMENTAL FARMS

(Inches)

Station	Yrs. Ave.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Charlottetown, P.E.I.	33	4·07	3·40	3·59	2·87	2·79	2·83	3·07	3·26	4·19	4·34	3·83	4·74	42·98
Kentville, N.S.	31	3·84	3·25	3·23	2·74	2·49	2·91	3·01	3·31	3·63	4·23	4·04	3·95	40·63
Nappan, N.S.	36	3·22	2·79	2·92	2·64	2·43	2·87	2·93	3·12	3·63	3·97	3·76	3·65	37·93
Fredericton, N.B.	31	3·32	2·64	3·14	3·17	2·67	3·45	3·18	3·57	3·60	3·93	3·13	3·10	38·90
Lennoxville, P.Q.	28	3·21	2·35	3·10	2·77	2·84	3·98	4·15	3·60	3·73	3·74	3·27	2·95	39·69
Ste. Anne, P.Q.	30	2·79	2·60	2·61	2·65	3·06	3·59	3·59	3·22	3·68	3·29	2·71	2·37	36·16
L'Assomption, P.Q.	13	3·10	2·31	2·88	2·88	2·69	3·29	3·82	3·41	3·34	2·93	2·94	2·95	36·54
Normandin, P.Q.	8	1·80	1·90	2·26	1·58	2·58	3·29	4·23	4·00	3·57	2·61	2·21	2·62	32·65
Ottawa, Ont.	57	2·91	2·38	2·65	2·38	2·80	3·43	3·60	3·13	2·99	2·73	2·63	2·85	34·48
Harrow, Ont.	28	1·98	1·98	2·32	2·62	2·40	3·01	2·27	2·08	2·58	1·94	1·74	1·92	26·84
Kapuskasing, Ont.	27	1·93	1·17	1·71	1·75	2·07	2·58	3·29	3·14	3·35	2·14	2·24	2·03	27·40
Delhi, Ont.	10	2·98	3·19	2·92	3·29	3·41	3·29	3·26	2·72	3·35	2·53	2·82	2·67	36·43
Morden, Man.	24	0·85	0·90	1·10	1·29	2·14	3·12	2·77	1·89	2·10	1·26	1·15	0·89	19·47
Brandon, Man.	47	0·89	0·67	0·96	1·17	1·95	3·13	2·81	2·50	1·92	1·03	0·86	0·79	18·68
Melita, Man.	10	0·66	0·84	1·35	1·21	2·31	4·00	2·90	3·43	1·31	1·01	0·90	0·53	20·45
Indian Head, Sask.	46	0·77	0·69	1·06	0·89	1·91	3·47	2·32	1·98	1·74	1·20	0·90	0·76	17·69
Swift Current, Sask.	57	0·67	0·58	0·71	0·80	1·79	2·97	2·17	1·78	1·21	0·75	0·50	0·60	14·53
Scott, Sask.	31	0·68	0·59	0·66	0·90	1·44	2·33	2·18	1·56	1·32	0·73	0·62	0·69	13·69
Melfort, Sask.	31	0·53	0·32	0·71	0·71	1·63	2·48	2·74	1·99	1·90	0·93	0·74	0·49	15·17
Regina, Sask.	50	0·52	0·35	0·66	0·81	1·70	3·06	2·17	1·71	1·30	0·82	0·58	0·42	14·10

Lethbridge, Alta.	41	0·63	0·67	0·87	1·14	2·35	2·77	1·74	1·55	1·72	0·90	0·75	0·67	15·76
Lacombe, Alta.	35	0·62	0·63	0·75	1·15	1·96	3·38	2·78	2·37	1·56	0·82	0·70	0·63	17·35
Manyberries, Alta.	14	0·56	0·48	0·73	1·01	1·33	2·71	1·33	0·73	0·99	0·67	0·59	0·59	11·72
Beaverlodge, Alta.	27	1·32	0·89	1·21	0·82	1·50	2·05	2·32	1·85	1·79	1·21	1·35	1·25	17·56
Fort Vermilion, Alta.	34	0·66	0·39	0·60	0·52	1·27	1·75	1·88	1·66	1·25	0·71	0·58	0·62	11·89
Agassiz, B.C.	48	7·67	5·72	5·41	4·23	4·24	3·84	1·93	2·17	4·21	6·56	8·04	8·26	62·28
Summerland, B.C.	27	0·97	0·70	0·67	0·70	0·90	1·17	0·75	0·65	0·80	0·82	0·97	1·35	10·45
Saanichton, B.C.	29	4·36	3·27	2·66	1·49	1·07	1·07	0·67	0·74	1·43	2·98	3·76	6·10	29·60
Prince George, B.C.	25	1·81	1·21	1·44	0·84	1·34	2·06	1·63	1·94	2·00	1·99	1·87	1·85	19·98
Smithers, B.C.	9	1·70	1·01	0·97	0·78	1·11	1·83	1·76	0·98	1·39	1·78	1·85	1·80	16·96
Whitehorse, Y.T.[1]	6	0·45	0·43	0·72	0·29	0·57	1·26	1·82	1·17	1·65	1·00	1·10	0·65	11·11
Fort Simpson, N.W.T.[2]	42	0·72	0·70	0·48	0·70	1·37	1·46	1·99	1·47	1·31	1·07	0·85	0·84	12·96

[1]Records taken at airport; Experimental Station located 100 miles west.
[2]Records taken by Meteorological Division, Department of Transport.

Meteorological records taken in cooperation with the Meteorological Division,
Department of Transport, Canada.

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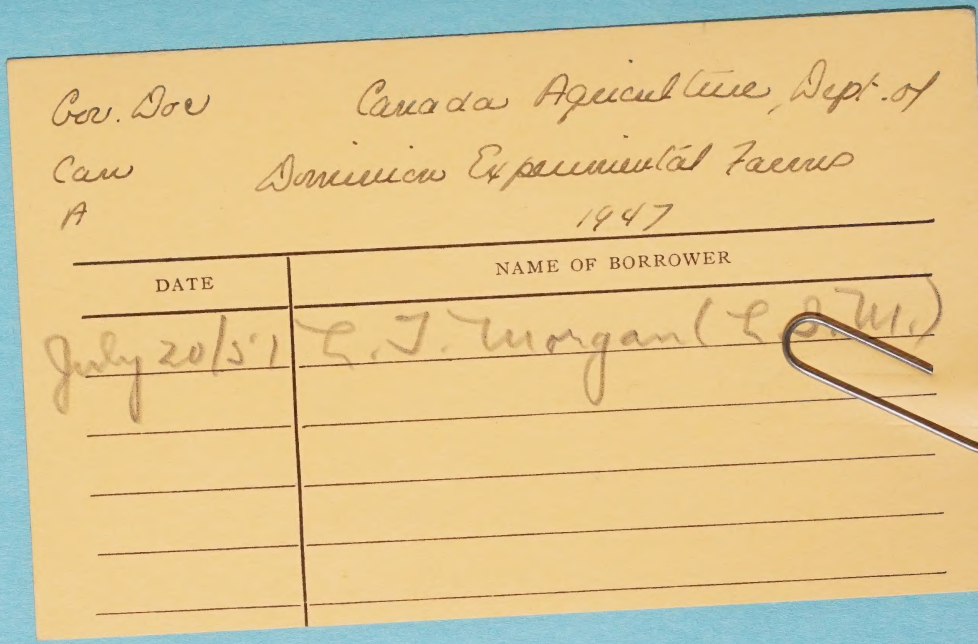

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